SECTION 14

STARTER MOTOR

Part B

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14B .1 SPECIFICATION:

Voltage	12 volt negative ground

Starter motor

Make	LUCAS - TVS

Model

Normal duty - 2600 Series tractors.....	3SM114
Voltage	12 volt
Type.....	Pre-engaged

Bolt torques

Starter motor terminals - M8	62 lbf.inch (7 Nm).

14B . 2 GENERAL DESCRIPTION

The electrical system for the 2600 series tractor is 12 volt negative ground. The starter motor is mounted on the right-hand side of the 3 cylinder engine tractors. A neutral start switch is fitted on the top of the transmission and on the PTO control lever. This renders the starter motor inoperative until the dual range selector lever is in the neutral position and the PTO lever/switch is in the disengaged position. A relay controls the supply to the starter solenoid to prevent voltage drop.

14B .3 STARTER MOTOR

Introduction:-

The starter is a motor which converts electrical energy, supplied from the battery, into mechanical energy for the purpose of cranking the engine.

The 2600 series tractor uses the pre-engaged type which is fitted with a solenoid which engages the starter pinion with the flywheel ring gear before the starter is energised. After engagement the pinion is retained in mesh for as long as is necessary to start the engine. When the engine is firing and the pinion is being driven at high speed by the flywheel, the armature is protected against over-speeding by the flywheel action of an inbuilt clutch.

In the event of a problem with the starter motor or circuit the following procedure should be adopted:

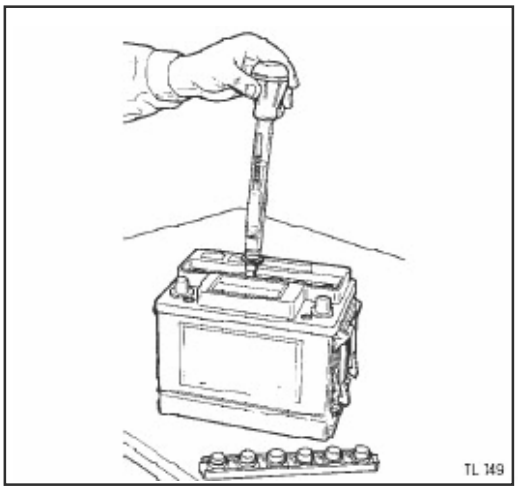

Fig 1

14B .4 Starter motor testing

TEST 1-Checking battery condition (Fig. 1)

Take the hydrometer reading of the battery cells to establish the state of the charge.

Diagnosis

Result	Action
Reading below 1.230	Recharge the battery or replace and retest
Reading 1.230 - 1.290	Proceed to test 2

Alternative test (Fig. 2)

Measure the open circuit voltage of the battery with the MF.3005 Digital Multimeter to establish the state of the charge.

Result	Action
12 Volts	Discharged battery - Recharge
12.4 Volts	50 % charge - recharge
12.7 + Volts	Fully charged

TEST 2 - Checking connections

Check that all battery, ground, starter motor and solenoid connections are clean and tight

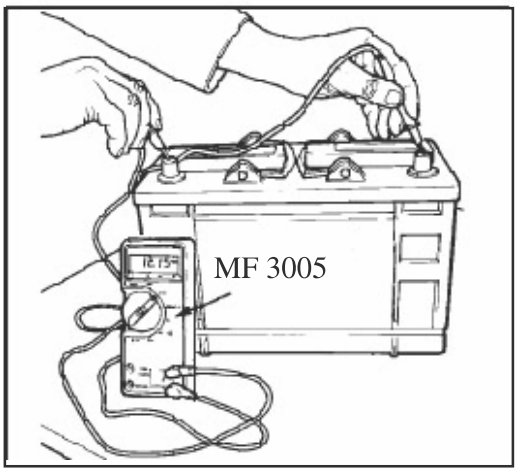

Fig 2

Diagnosis:

Result	Action
Loose and /or dirty	Rectify
Statisfactory	Proceed to test 3

TEST 3 -

Checking battery voltage on load (Fig.3)Connect a voltmeter across the terminals, as shown in Fig. 3, stop control out: operate the starter switch

Diagnosis:

S.NO	RESULT	ACTION
1	Reading below 9 volts	Remove battery for recharging
2	Reading above 9 volts	Proceed to test 4

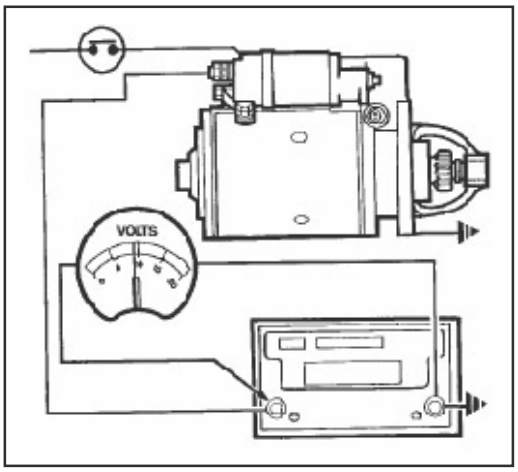

Fig. 3

TEST 4:-

Checking the voltage to the solenoid (Fig. 4)

If the solenoid operates intermittently during the test or the engine is cranked at low or irregular speed, there may be insufficient voltage at the solenoid operating winding terminal or the solenoid is faulty.

To check the circuit for high resistance (poor connections) connect the voltmeter between the solenoid operating terminal and ground (commutator end bracket) as shown in Fig. 4. When the switch contacts are closed, the reading on the voltmeter should be slightly less than the reading in the first part of test 1. A satisfactory reading indicates a negligible voltage drop in the circuit and consequently the fault may be in the solenoid.

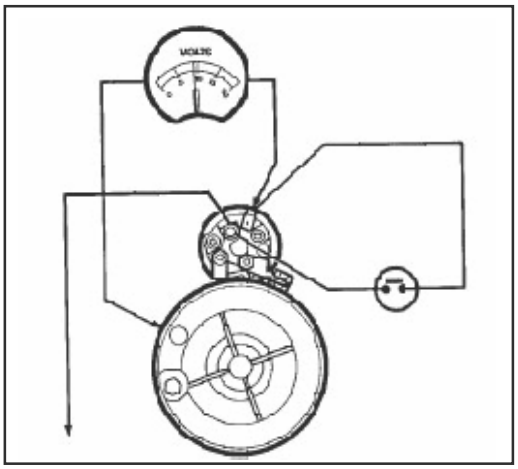

Fig. 4

TEST 5 (Fig. 5) :-

Checking the starter terminal voltage under load conditions (Fig. 5) Connect a voltmeter between the starter input terminal and ground (commutator end bracket) as shown in Fig. 5, stop control out, operate the starter switch.

Diagnosis:

S.NO	RESULT	ACTION
1	Difference in reading taken in test 3 - 0.5 volts	Check all connection
2	Same as in test 3	Proceed to test 5

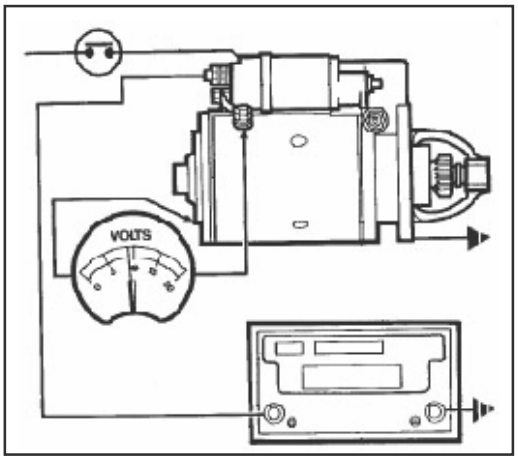

Fig. 5

TEST 6 -

Checking the voltage drop on the insulated line (Fig. 6) Connect a voltmeter between the starter input terminal and the battery positive (+) terminal as shown in Fig.6.

When the starter switch is open the voltmeter should register battery voltage.Stop control out, operate the starter switch.

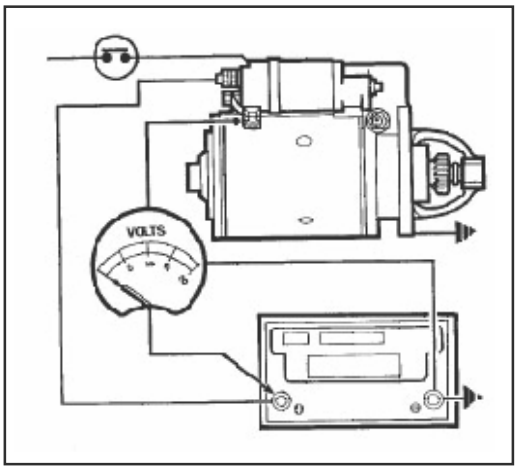

Fig 6

Diagnosis

S.NO	RESULT	ACTION
1	High voltage reading	Rectify faulty or dirty connection
2	Voltage reading partically ZERO	Proceed to test 6

TEST 7 -

Checking the voltage drop across the solenoid contacts (Fig. 7)

Connect a voltmeter between the two main solenoid terminals as shown in Fig.7. When the starter switch is open the voltmeter should register battery voltage. Stop control out, operate the starter switch.

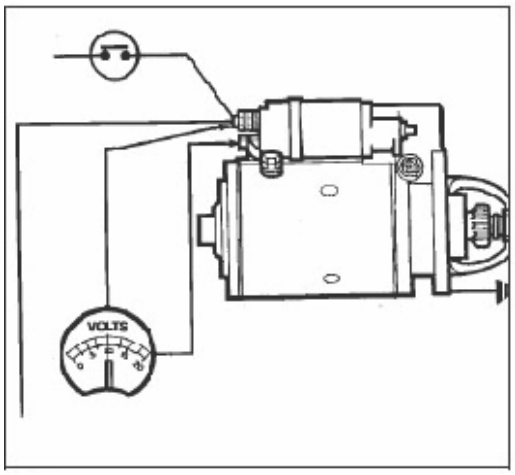

Fig 7

Diagnosis

S.NO	RESULT	ACTION
1	High voltage reading (similar to test 5)	Faulty solenoid - Replace
2	Voltage reading partically ZERO	Solenoid satisfactory

TEST 8:-

Checking the voltage drop on the ground line (Fig. 8)Finally check the voltage drop on the ground line. Connect the voltmeter between the battery ground terminal,as shown in Fig. 8, at the following points:

1. Starter commutator end bracket.
2. Starter body.
3. Engine.
4. Battery connection to ground.With the stop control out, operate the starter switch

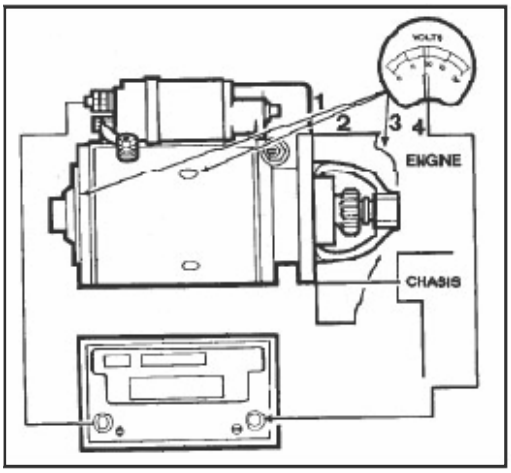

Fig 8

S.NO	RESULT	ACTION
1	Above 0.5 volt	Check all ground connections between starter and battery
2	Voltage reading partically ZERO	Ground lines statisfactory

14B . 5 TRANSMISSION NEUTRAL START SWITCH

Removal and refitment

Removal

1. 2600 tractors - Pull the cable and lift the hood
2. Disconnect the battery, removing the negative cable (-) first in the interest of safety.
3. Disconnect the two wires.
4. Unscrew the switch from the top of the gearbox.

Refitment

5. Reverse procedures 1 to 4.

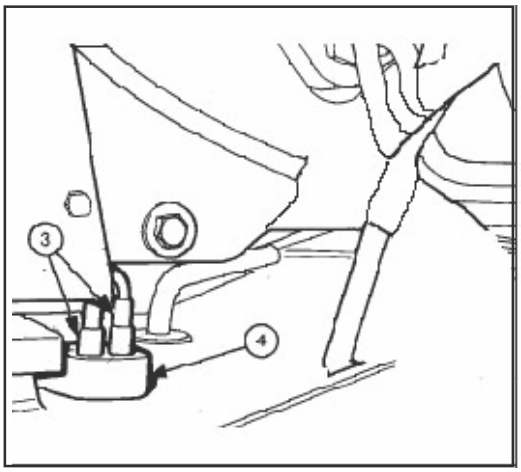

Fig 9

14B . 6 PTO NEUTRAL START SWITCH

Removal and refitment

Removal

1. Disconnect the battery, removing the negative cable (-) first in the interest of safety.
2. Turn back the rubber boot.
3. Disconnect the two wires.
4. Unscrew the retaining nut.
5. Remove the switch.

Refitment

6. Reverse procedures 1 to 5.

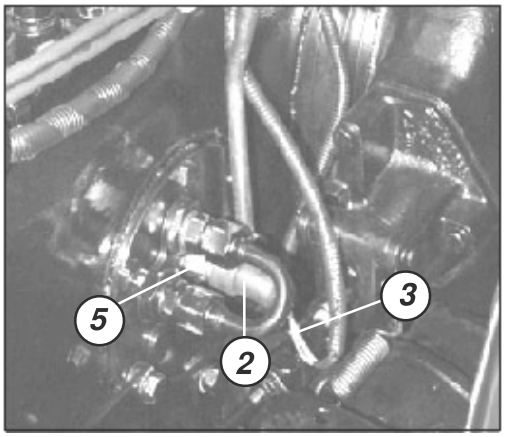

Fig 10

14 B . 7 STARTER MOTOR

Removal and refitment

Removal

1 2600 tractors - Pull the cable and lift the hood

2 Disconnect the battery, removing the negative cable (-) first in the interest of safety.

3 Disconnect the cables from the starter solenoid.

4 Remove the nuts and washers and/or mounting bolts.

5 Withdraw the motor, while supporting it from beneath.

Refitment:

WARNING: All guards and covers over the electrical terminals on the starter MUST be replaced to prevent starting the engine by shorting across the terminals.

7. Reverse procedures 1 to 5 except:

a. Tighten the starter motor terminal to a torque of 62 lbf.inch(7 Nm).

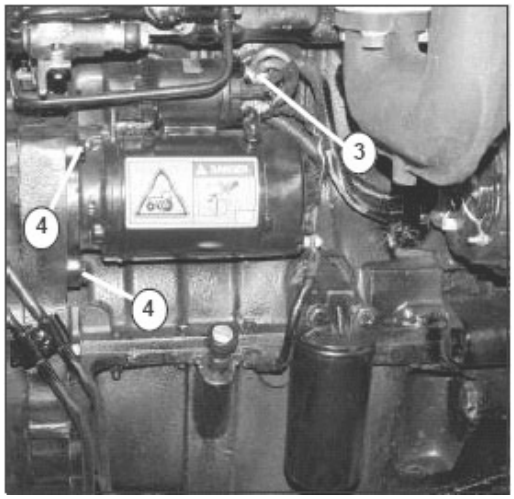

Fig 11

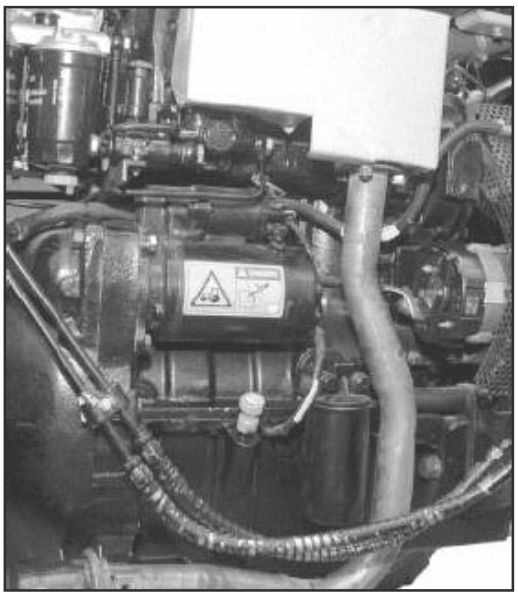

Fig 12

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